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U. S. Board for Investigation and
Control of Influenza ... Neurotropic
Virus Disease Commission. Report
of the Middle East Expedition

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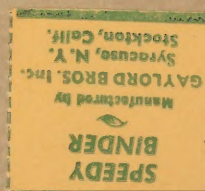


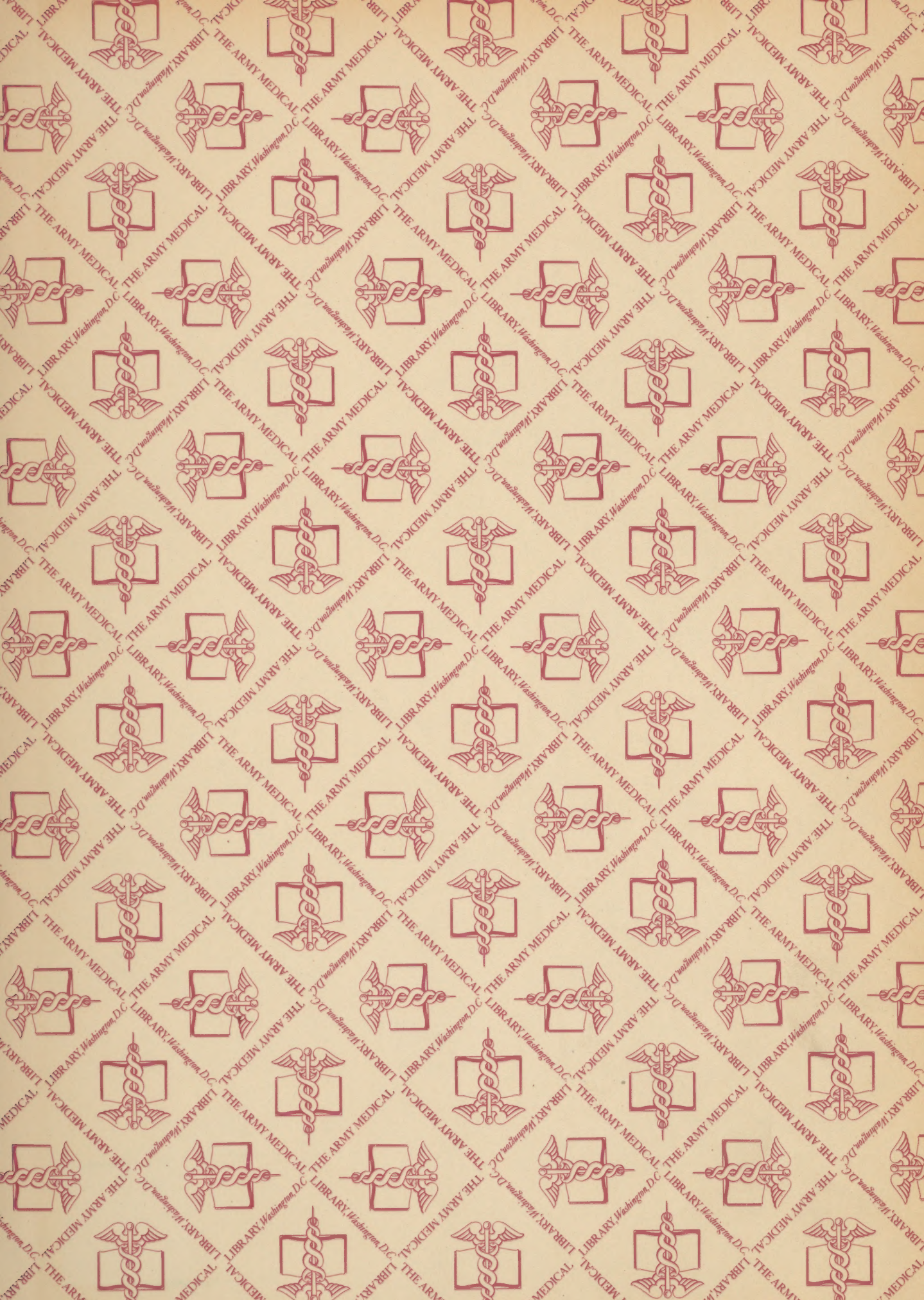
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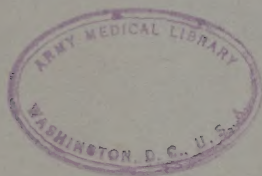
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RESTRICTED

REPORT
of the
MIDDLE EAST EXPEDITION
of the
"VIRUS COMMISSION"



by Members of the Neurotropic Virus Disease Commission
of the
Board for the Investigation and Control of Influenza
and other Epidemic Diseases in the Army
in the
Preventive Medicine Service of the Office of the Surgeon General
U.S. Army

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FOREWORD

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This Report deals with the work of the "Virus Commission" during its assignment of 10 months (April 1943-February 1944) with the U. S.

Army Forces in the Middle East and Mediterranean Areas. It consists mainly of general observations, in which are included the methods used

in equipping our expedition and in establishing and maintaining its laboratory. The details have been included in a manner to make them

of possible value to other Commissions of similar nature charged with similar duties. The experimental activities of the Commission are only mentioned briefly. Eventually they will appear as separate publications.

An account of work done in the
Middle East and Mediterranean Area
(April 1943-Feb.1944)

by Members of the Neurotropic Virus Disease Commission
of the
U. S. Board for the Investigation and Control of Influenza
and other Epidemic Diseases in the Army.
in the
Preventive Medicine Service of the Office of the Surgeon General
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For support and the maintenance of our work in Egypt we wish to thank the following officers: Col. Crawford F. Sans, M.C., Chief Surgeon of the U.S.A.F.I.M.E. April - August 1943, and his successor, Col. D. W. Billick, M.C., Lt. Col. Frank K. Sewall, M.C., Executive Officer, Major Thomas G. Ward, M.C., Epidemiologist, and Maj. Andy Little, Pharm. C., Supply Officer of the Medical Section, Headquarters S.O.S., at Cairo.

For his warm support of our work we are greatly indebted to Col. Hall G. Van Vlack, M.C., Commanding Officer of the 38th General Hospital, and members of his staff, in particular Lt. Col. E. B. Nye; also to Lt. Col. B. L. Keyes, M.C., Chief Surgeon, Delta Service Command, U.S.A.F.I.M.E.

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The National Foundation for Infantile Paralysis contributed the sum of \$15,000.00 to aid in the work of the Middle East Expedition of the Neurotropic Virus Disease Commission. Grateful acknowledgment is made of this grant.

Acknowledgment of assistance from many sources and from many individuals whose names are too numerous to mention in this brief report, is due.

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advice to Maj. C. E. van Rooyen, R.A.M.C., Director of Virus Research at the 15th Scottish Hospital, to Maj. C. R. Amies, R.A.M.C., Pathologist, 63rd General Hospital, and to Brig. Sydney Smith, R.A.M.C., Consultant in Tropical Medicine, M.E.F.

Assistance has also been rendered by the Hebrew University at Jerusalem, particularly by Professors S. Adler and I. J. Kligler of the Departments of Parasitology, and Hygiene, respectively.

We are also indebted to Col. Wm. S. Stone, M.C., Preventive Medicine Service, N.A.T.O.U.S.A.; to Col. D. Franklin, M.C., Chief Surgeon, Seventh Army; and to Col. O. B. Bolibaugh, M.C., Commanding Officer of the 59th Evacuation Hospital, Palermo, Sicily; to Col. Ostrander, M.C., Chief Surgeon; and Lt. Col. A. A. Carabelli, M.C., Medical Consultant, Persian Gulf Service Command.

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Purpose of Expedition: In October, 1942 inquiries were made to determine whether more first hand information could be obtained about poliomyelitis and encephalitis cases which were known to have occurred among British troops stationed in the Middle East. Plans for this investigation did not materialize at that time but in February, 1943 it was decided that besides poliomyelitis, other virus diseases of an epidemic nature to which American troops abroad were being exposed, such as encephalitis, sandfly fever, and infectious hepatitis, also warranted first hand investigation with a view to their possible control from a military standpoint. The basis for this decision rested on the fact that requests had already been received from the Medical Section in Cairo asking that a laboratory be sent to that theatre to investigate infectious hepatitis and other epidemic problems.

This was the origin of the "Virus Commission" which was organized under the Neurotropic Virus Disease Commission, originally with the following members: Dr. J. R. Paul (Director), Maj. A. B. Sabin, M.C., Maj. C. B. Philip, Sn. C., (Entomologist). This group was charged with the duty of either setting up and operating a local laboratory in the Middle East (or elsewhere) or of collecting material to be sent home for investigation.* In the orders issued to members of the Commission the period of about 6 months was designated as the time probably necessary for the performance of this work.

Duration of Work in the Field: Members of this Commission received orders on March 26, 1943 to proceed from the United States to British and French Possessions in North Africa, Egypt, Palestine, Iran and Iraq, for the purpose of studying neurotropic virus diseases, and to

* See letter, April 5, 1943, by Dr. F. G. Blake to Col. S. Bayne-Jones, M.C., outlining the scope of the work to be undertaken.

return to the United States upon completion of this temporary duty of approximately 6 months.*

The Commission left the United States on April 22, 1943; arrived in Cairo, Egypt on April 28, 1943, and reported for duty to Col. Crawford F. Sams, M.C., Chief Surgeon of the U.S.A.F.I.M.E. Under his direction and later under the direction of his successor, Col. D. W. Billick, M.C., the Commission established and maintained its laboratory and experimental ward in connection with the 38th General Hospital at Camp Russell B. Huckstep, the desert camp in the vicinity of Cairo. This building was ready for use on May 20th and was maintained as an active laboratory until December 15th.

During the course of their studies, members of the Commission visited, besides Egypt, Palestine, Iraq, Iran and India to the east; the Anglo-Egyptian Sudan and Eritrea to the south; Libya, Tripoli, Tunisia, Algeria and Sicily to the west.

Major A. B. Sabin returned to the United States on September 29th, in order to carry on part of the work in the United States. Major Philip was transferred to the Typhus Commission with headquarters in Cairo on December 15th, and Dr. Paul, accompanied by Capt. W. P. Havens, Jr., M.C., (on detached service with the "Virus Commission") returned to the United States on February 13th, 1944. All transportation between the United States and Africa was accomplished by air.

Only part of the studies initiated in the Middle East could be carried to satisfactory completion there. Because of the urgent nature

* Designated as the "Virus Commission" at the Medical Section Headquarters U.S.A.F.I.M.E., the correct title should be the Neurotropic Virus Disease Commission of the Board for Investigation and Control of Influenza and Other Epidemic Diseases in the Army, in the Preventive Medicine Service, Office of the Surgeon General, U. S. Army. A list of the personnel as of September 20, 1943, will be found in the Appendix, Section I. +

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of the problems, two laboratories were subsequently established in the United States to develop the leads encountered in the overseas work. Thus, as the result of this expedition, studies on sandfly fever have been carried on (since October, 1943) by Maj. A. B. Sabin, M.C., at Cincinnati, and later at the Rockefeller Institute at Princeton, New Jersey; and a laboratory for work on infectious hepatitis was established at the Yale University School of Medicine in March, 1944 under the direction of Dr. J. R. Paul and Capt. W. P. Havens, Jr., M.C. Investigation of the strains of poliomyelitis collected in the Middle East and returned to the United States in October, 1943, has also been carried on at Yale by Dr. R. Ward.

Program of Work: Three diseases were specifically designated to receive special attention by this Commission. These were:

- A. Sandfly fever.
- B. Poliomyelitis.
- C. Infectious hepatitis.

Two of these diseases, A and B, are definitely virus diseases, the third is presumably a virus disease. All three are both epidemic and endemic in the Middle East and Mediterranean area. Sandfly fever and infectious hepatitis have been studied, from the military standpoint, by British, French, Russian and German investigators, but prior to April, 1943, no American investigators had had occasion to record their observations on any of these diseases in this general area or to bring some of the newer virus techniques, so familiar to us in this country, to bear on the problems within these epidemic areas.

Almost immediately after our arrival in Cairo, a plan was drawn up outlining the methods of study which we proposed to do on these 3 problems and designating the time which we proposed to allot to each. This

in the United States, the Government has been very active in the
control of the disease in the United States in the various parts.
There are two forms of the disease, namely the acute and the chronic.
The acute form has been reported on (since October, 1923) by Dr. A. G. Davis, M.D., of
Chicago, and later at the Rockefeller Institute at Princeton, New
Jersey, and a laboratory for the study of the disease has been
established at the Yale University School of Medicine in March, 1924, under the di-
rection of Dr. A. G. Davis, M.D., and Dr. J. H. Brown, M.D., and
the study of the disease has been continued in the United States and
abroad. In the United States in March, 1923, the first case was
reported on at Yale by Dr. A. G. Davis.

SYMPTOMS AND SIGNS These diseases were specifically designated

in the United States as follows: (1) Acute disease, (2) Chronic disease.

- A. Acute disease.
- B. Chronic disease.
- C. Latent disease.

Two of these diseases, A and B, are definitely virus diseases,
the first is primarily a virus disease. All three are fatal diseases and
infectious in the United States and in other countries. Acute disease and
latent disease are fatal diseases, the first is primarily infectious, by
contact, through the air, and through the food. The second is primarily
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plan was submitted to Colonel C. F. Sams, M.C., Chief Surgeon, U.S.A.F.I.M.E., and to the Surgeon General's Office.¹ In general, four objectives were designated:

1. Clinical--To familiarize ourselves with the clinical picture of each of these diseases as they appeared in the Middle East, and to assemble all possible data which might aid in clinical diagnosis.

2. Epidemiological--To record the frequency of the diseases under discussion during previous years, and to make first hand observations on the present endemic and epidemic prevalence of these diseases in military installations; in particular, the attempt was also made to analyze the circumstances under which the diseases prevailed, or were absent within endemic areas.

3. Experimental--To isolate and study the etiological agent if possible, and to develop this knowledge for use in diagnosis and the study of immunity.

4. Prophylactic or therapeutic--To determine any possible means of preventing the spread of these infections, or controlling infection when present.

Establishment of Middle East Laboratory: In field expeditions for the investigation of epidemic (or endemic) disease, the question arises at the outset as to how much laboratory work should be done on the spot, and how much material (to be tested) should be sent back to well equipped laboratories at home. In the Army today, one has the advantage of courier service and air transport, thus increasing the facility with which material can be shipped and this, together with the use of dry ice in proper thermos containers, makes it possible to transport perishable material far more easily than has been the case before. A small laboratory, serving merely as a collecting station, may in most

and in the *Journal of the American Chemical Society*.¹ In general, these authors have

2. Medical Records--To record the frequency of the disease

It is possible that the above information is not complete and that there may be other information available to the public which is not included in this report.

...the ... of ...

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various of courier service and air transport, thus increasing the

1. The first of these is the fact that the Commission has not yet received any information from the Government of the United States regarding the activities of the Committee for the Liberation of the People of the East (CLPE) in the United States. The Commission is therefore unable to provide any information on this matter.

Small laboratory, working mostly in a collecting station, say in east

instances be sufficient for the needs of an expedition of this type, provided there is proper liaison between it and the home base, and provided the home laboratory is equipped and ready to handle the special material which may be sent to it. On the other hand, the field investigative laboratory has still another function, namely that of assisting the hospitals and medical officers in their "front line" problems and of bringing into their midst an interest in investigation, for in Army Hospitals in war time, such interests readily lapse.

With these thoughts in mind and in view of the particular problems with which the Commission had to deal, it was their early decision to establish a laboratory for clinical investigation in the field. On the recommendation of Col. Crawford F. Sams, M.C., the laboratory was established as an Army institution.* It was located at the 38th General Hospital at Camp Russell B. Huckstep, about 15 miles from the center of Cairo. Members of the Commission were billeted in Cairo, in order to maintain daily contact with the Medical Section Headquarters, the Typhus Commission, the Medical Library, and certain British Hospitals.

* Other alternatives were those of establishing the laboratory in association with local Public Health Institutions or even in association with a University.

testimony in relation to the work of an organization of this type.
 The following is a list of the names of the persons who, and who
 with the same intention, in person and work to render the special
 material which may be used in it. In the other hand, the final line
 investigation, however, has been carried out, namely that of making
 the the principal and selected officers in their various lines of business
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 Commission, the National Library, and certain British Hospitals.

LABORATORY BUILDING

The building selected by the Commission for its laboratory and experimental ward was a hospital ward building (Ward 36); see Figure 1. Remodeling of the ward was not extensive. The major task was that of making it sandfly proof in order that transmission experiments with the virus of a pappataci fever could be properly carried out and that patients suffering from this disease, could be housed within a sandfly area. Double doors were installed with an intervening curtain of bolting cloth. Windows in two thirds of the building were screened with ~~stainless~~ cloth, and all rooms in which patients were to be quarantined were similarly equipped with double doors and cloth curtains. See plan Figure 3. It will be noted in this plan that the space allotted to the care of patients (necessary in clinical investigation of this type) amounted to about 65% of the total space available in the building.

The necessary screening of the sandfly proofed section of the laboratory and ward rooms reduced the amount of ventilation within the building so that during the months between May and October, with outside temperatures ranging during the day up to 118°F., living and working conditions in this building were "not ideal". Installation of small, air conditioning units in the patients' rooms and in the "cold" room was therefore desirable.

Installations of this type, which required special attention in this building were: (1) refrigerator units, (2) air conditioning units, and (3) gas.

1. Two types of refrigerators to maintain ice box temperatures (4°C.) were necessary: (a) electric and (b) kerosene. Frequent breakdowns of either the electric or kerosene mechanism did not occur simultaneously but without two refrigerators much valuable perishable material

INVESTIGATION

The building selected by the Commission for the laboratory and experimental work was a temporary tent building located at the site of the building of the tent was not satisfactory. The object was not that of building a smaller tent in which tent building was necessary with the view of a permanent tent would be necessary because the tent building selected from this disease, could be housed within a smaller tent. Tent building was located with an experimental tent at the site. There was in the tent of the building were arranged with the tent building and all rooms in which patients were to be quarantined were similarly equipped with electric lights and other equipment. The plan figure 1. It will be noted in this plan that the space allotted to the care of patients (necessarily the clinical investigation of this type) occupied no more than of the total space available in the building.

The necessary arrangement of the building provided for the laboratory and ward rooms behind the main of ventilation which was located at the front of the building between the tent building and the entrance. The entrance leading into the tent was up to the tent building and meeting the entrance to the building was "not ideal". Investigation of small, the ventilation with in the patients' rooms and in the tent was not therefore desirable.

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would have been lost.

A large insulated refrigerating box for the storage of materials in dry ice was also constructed. It was found useful during the periods when the amount of perishable material in the laboratory was large; otherwise six 4-gallon capacity thermos cans were used for dry ice storage. Dry ice was obtained only in Alexandria - 100 miles distant. The supply was shipped three times per week by train to Cairo. Transportation to insure its safe delivery to the laboratory was the responsibility of the Commission.

2. Three small air conditioning units were installed; two of them in the patients' rooms, and one in the "cold room" where incubators were kept, and where it was essential that the temperature should not go above 98°F. With daily inspection and maintenance service these units functioned fairly satisfactorily.

3. Installation of gas pipes and outlets for use with detachable tanks of butane gas (obtainable in Cairo) was necessary for the two laboratory units. Butane gas proved highly satisfactory.

Equipment and Animals: The average Army Hospital Laboratory and Medical Supply Depot abroad is not at present supplied with much of the laboratory equipment necessary for research work in virus diseases. This equipment calls in particular for special containers to be used in connection with the storage of infected or virus bearing material in dry ice, -- at a temperature of from -20° to -70°C. It calls for lyophilization apparatus, glycerine of special grades, mortars and pestles, instruments appropriate for use in the inoculation of developing chick embryos and for the inoculation and autopsy of animals of various sizes ranging from mice to monkeys. A list of the various items which were taken with us appears in the Appendix, Section II. This material was packed in three

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trunks (2 metal, weight 50 lbs. each and 1 light trunk, weight 25 lbs.) making a total weight of equipment when packed for air transport of 475 lbs. En route these trunks were kept with the baggage of the Commission at all times.

Animals: Adequate facilities for the proper care of animals is one of the first requisites of any unit attempting to study virus diseases. For this purpose a section of the Animal House of the 38th General Hospital was assigned to our Commission. This space proved small but adequate, and consisted of three rooms, in one of which small animals (rodents) were installed. In the other two, suitable monkey cages were constructed according to specifications which have been used by the Yale Poliomyelitis Unit.* Considerable time was necessary for the training of enlisted personnel for the proper care of laboratory animals. Frequent replacements were necessary among men assigned to this work.

Animals of the following types were obtained with some difficulty from the following sources:

1. White mice—A satisfactory breeding colony was secured from the Egyptian Serum Institute, Cairo. This was obtained through the assistance of the Typhus Commission.

2. Hamsters—Breeding of these rodents was not successful in our laboratory. A small supply of these animals was obtained from Dr. I. J. Kligler of the Hebrew University Medical School at Jerusalem. The used and unused hamster stock was eventually turned over to Dr. J. O. W. Bland at the Memorial Ophthalmic Institute in Cairo and to Maj. Tracy B. Mallory, M.C., at the U. S. Army Laboratory No. 15 at Naples.

* The Construction Division and Post Utilities Division at Camp Russell B. Huckstep were of great assistance in the rapid and excellent construction of these animal quarters and other types of construction work. Acknowledgment of this special service is made at this time.

Animals (2 males, weight 50 lbs. each and 1 light female, weight 25 lbs.)
weight of equipment when packed for air transport of 175
lbs. In route these trucks were kept with the baggage of the Commission.

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(rodents) were installed. In the other two, suitable monkey cages were
connected according to specifications which have been used by the Yale
Polymerase Unit. * Considerable time was necessary for the training
of enlisted personnel for the proper care of laboratory animals. Frequent
replacements were necessary among men assigned to this work.

Animals of the following types were obtained with some diffi-

culty from the following sources:

1. White mice--A satisfactory breeding colony was secured from

one of the Typhus Commission.

2. Hamsters--Breeding of these rodents was not successful in

our laboratory. A small supply of these animals was obtained from Dr.
I. J. Kiefer of the Hebrew University Medical School at Jerusalem. The
used and unused hamster stock was eventually turned over to Dr. J. O. W.
Blair at the Memorial Ophthalmic Institute in Cairo and to Maj. Tracy B.
Mellory, M.C., of the U. S. Army Laboratory No. 15 at Naples.

* The Commission Division and Post Utilities Division of Camp Russell B.
hatched some of great interest in the night and excellent connection
of these animal persons and other types of connection work. Acknowledg-
ment of this special service is made at this time.

Gerbils (2 species, Gerbilis gerbilis and Gerbilis andersoni) were obtained from the Typhus Commission.

Guinea pigs and rabbits were obtained from the supply at the Laboratory of the 38th General Hospital, from Camp Russell B. Huckstep Farm, and from the National Hospital Supply Company in Cairo. Guinea pigs were not particularly healthy and deaths were frequent in this colony.

Monkeys were obtained with some difficulty from the following sources:

1. By purchase from the Memorial Ophthalmic Institute of Cairo.
2. By barter from Cairo Zoological Gardens.
3. Through the Supply Officer (Maj. Andy Little, Pharm. C.) of the local Medical Section Headquarters who procured the animals at (1) Khartoum, where they were collected by natives in the Anglo-Egyptian Sudan; and (2) in Eritrea, where they were collected by members of the U. S. Army Veterinary Corps and by natives.
4. By purchase from the Rockefeller Foundation Yellow Fever Laboratory at Entebbe, Uganda. We are indebted to Dr. K. C. Smithburn for arranging for this transaction.

5. By purchase from individuals.

The following species of monkeys were used:

- (a) Common grivet monkeys (Cercopithecus griseoviridis or Cercopithecus aethiops aethiops).
- (b) Central African vervet monkeys (Cercopithecus aethiops centralis).
- (c) Hussar monkeys (Erythrocebus patas).
- (d) Small baboons (Papio hamadryas).
- (e) Bonnet Monkeys (Macaca radiata).

About 50 individual monkeys were used in all.

At the termination of work all surviving monkeys were turned over to the Memorial Ophthalmic Institute of Cairo.

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Monkeys were obtained with some difficulty from the following

It has been ever since that of 1904

in the production of work all surviving members were found

VOLUNTEERS

Volunteers as Subjects for Experimental Infection: Inasmuch as the virus of sandfly fever and the infective agent of infectious hepatitis are not known to infect experimental animals, it was necessary to use human subjects in order to "isolate" the etiological agent of these diseases. Considerable discussion was held before a satisfactory method of selecting volunteers to act as human subjects was reached. It was necessary to secure young, healthy adults who were not suffering from any other known form of infection, who were willing to be placed in quarantine (strict isolation) for a period of 4 to 6 weeks; who had not been in Egypt during the past summer and were therefore not immune to sandfly fever; whose temperament was such that they could withstand the long period of isolation cheerfully; and above all who could be spared by their unit for this period of time. It was also found advisable to take only those men who were resident in the local camp.

To obtain these men the assistance of Lt. Col. B. L. Keyes, M.C., Chief Surgeon, Delta Service Command, was secured. Notices were posted by him on the bulletin boards of various units throughout the camp, and announcements were made at the local theatre. Later calls for volunteers were also published in local editions of the "Stars and Stripes," and the assistance of the officers in charge of the Medical Detachment at the 38th General Hospital was solicited.

Those men who wished to volunteer were interviewed by us and the nature of the situation before them was explained. No rewards were held out, with the exception of a statement that they would be entitled to a week's leave on discharge from the hospital on the Army's expense. Of the men coming to be interviewed under these conditions about 50 per cent proved acceptable. Five different lots of volunteers were chosen

RESULTS

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To obtain these men the assistance of Lt. Col. B. L. Weyer, M.C., Chief Surgeon, 3rd Cavalry Division, was secured. Letters were sent to him on the following points: (1) a list of names of volunteers was also published in local editions of the "Stars and Stripes," and the assistance of the officers in charge of the Medical Department at the 8th General Hospital was requested.

Those men who wished to volunteer were interviewed by us and the nature of the situation before them was explained. No rewards were held out, with the exception of a statement that they would be entitled to a week's leave on discharge from the hospital on the Army's expense. Of the men coming to be interviewed under these conditions about 20 per cent proved acceptable. Five different lots of volunteers were chosen

in this fashion totalling 19 men (one man was used twice). A sixth lot of 9 men was chosen on a different basis in which it was understood that they would be isolated only for a period of three weeks and would receive no injections.

During the period of experimental observation these men were isolated in the small rooms within the sandfly proofed section of our laboratory, for a preliminary period of 10 days. They were then "inoculated" and kept isolated and under observation for periods of from 3 to 5 weeks.

A week's leave was given to each man after he had completed his course. Per diem of \$3.00 a day was paid by the "Virus Commission" to all of the men while they were on sick leave, and the last group was also presented with a bonus of \$12.00. The bonus was given because they were the only group of volunteers who (due to their relatively easy assignment) were not recommended for the Legion of Merit.

All of these men acquitted themselves well during the uncomfortable period of illness and the tedious period of isolation. A list of their names appears in the Appendix (Section III). The example of fortitude which they set became well known to other members of the camp. All of the men who served in Groups 1 to 5 have been recommended for the Legion of Merit and of these, 14 had received it as of the date February 1st.

in this country, especially in the South, and the fact that
of 500,000 men, only 100,000 are in the service of the
Government, and the rest are in the hands of the
planters.

There are several reasons for this state of affairs.

First, the country is very large, and the population is
very sparse. It is difficult to find men in the
interior, and the Government has to go to the
coast to find them. Second, the country is very
poor, and the men are not interested in the
service of the Government.

Third, the country is very remote, and the men are
not interested in the service of the Government.
Fourth, the country is very poor, and the men are
not interested in the service of the Government.
Fifth, the country is very remote, and the men are
not interested in the service of the Government.

It is of these men that the Government is most in need.

These men are the backbone of the country, and the
Government must do everything possible to attract
them to the service. The Government must improve
the country, and make it more attractive to the
men. The Government must also improve the
education of the men, and make them more
interested in the service of the Government.

SANDFLY FEVER

Phlebotomus (Pappataci) Fever: This important epidemic disease of the Mediterranean area and Middle East is of military significance because of the susceptibility of fresh troops when brought into the epidemic areas during the proper season. It flourishes within areas (where conditions are favorable for the vector - Phlebotomus papatasi) and in some camps 75% or even more of the personnel may become infected during a single season.

Observations were made with regard to the prevalence of this disease during recent years in British and American troops in the neighborhood of Cairo.^{3,4,6,13,14} During the year 1943 three epidemics of the disease were observed in American troops first hand.^{6,14} Transmission of the disease to human subjects (volunteers) was successfully accomplished in 12 instances in the Middle East laboratory⁶ and in many more instances in studies which were carried on subsequently in the United States.¹³ This has given us a large source of cases from which new observations with regard to the clinical picture have been made. The size of the virus has been determined, the length of the incubation period when the disease is induced either by subcutaneous or by intravenous inoculation, has been measured and immunity studies on this disease have been started and are continuing.¹³

Observations on the environmental aspects of camps in which the disease flourishes were made and it was noted that the disease seems to flourish best in those camps or garrisons where vegetation was present or heavy and where contact with natives and animals was close.¹⁴

The use of a single insect repellent, namely dimethyl phthalate, has been tested against the vector, Phlebotomus papatasi, and is found to be effective in preventing bites.² It has also been given a clinical test

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disease during recent years in British and American troops in the neighbor-
hood of Cairo. ^{8,9,10,11,12} During the year 1913 three epidemics of the
disease were observed in American troops first named. ¹³ Transmission
of the disease to human subjects (volunteers) was successfully accomplished
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flourish best in those camps or garrisons where vegetation was present
or heavy and where contact with natives and animals was close. ¹⁶
The use of a single insect repellent, namely dieldrin, ¹⁷
has been found to be effective in preventing bites. ¹⁸ It has also been given a clinical test

during a single epidemic which goes far to furnish enough evidence to indicate that some protection was secured from the use of this repellent.¹⁴

It was the sense of the Commission that it is highly important for American medical officers in the Mediterranean area to have a full appreciation of the clinical picture of sandfly fever and the frequency of this disease.¹⁵

If properly recognized the cases can receive the proper designation and treatment; there will be less confusion with other febrile diseases such as malaria or influenza, and control measures of possible value can be introduced into the Command. In other words, it became our object to make the following point: Sandfly fever is an important military disease in certain areas in the Middle East and Mediterranean bases where our troops are now quartered. It is important that all medical officers in this area be familiar with this disease.

POLIOMYELITIS

This disease is common in Egypt and Palestine, frequent cases, many of them fatal, having occurred in British and American troops stationed in these regions and also in Libya and Tripoli. Rates in American troops were almost ten times those seen in this country. An investigation of the prevalence of poliomyelitis among the civilian population of Cairo was made and from the acquired information it was clear that this disease is more common there than has been usually suspected.^{6,9} This is also true of Palestine.⁹

The Commission was also concerned with diagnostic problems offered by a number of borderline or atypical cases of poliomyelitis (encephalitis or neuritis). In many of these cases the diagnosis was difficult and the nature of the disease obscure. Much of the work in detecting virus in the stools of patients was done for diagnostic reasons.⁹

Strains of virus from the stools of poliomyelitis cases were isolated by the "Virus Commission" at their Middle East laboratory. From 15 cases of poliomyelitis, 9 such strains were isolated. From 18 cases of borderline or atypical poliomyelitis, no strains were isolated.⁹ This work has been of some interest to British medical officers in the Middle East because the technique of virus isolation from stools had not been used in their laboratories.

In the course of these investigations, it was found that some of the local East African monkeys, including the grivet, the vervet, and the Abyssinian baboon, were highly susceptible to experimental infection of poliomyelitis virus.¹⁰

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In the course of these investigations, it was found that some of the local East African monkeys, including the guinea, the vervet, and the Abyssinian baboon, were highly susceptible to experimental infection of poliomyelitis virus.

INFECTIOUS HEPATITIS

The Commission was impressed by the magnitude of this problem as a military disease in the Middle East and Mediterranean area.^{8,11} Hundreds of military cases were seen in Egypt and thousands in North Africa and Sicily. Epidemics were investigated in Sicily and a report of the findings has been submitted.⁸ Many of the valuable British reports on this subject have been available to our Commission and we have benefited from informal discussions which have been held with various members of the R.A.M.C. in connection with problems about this disease. Major C. E. van Rooyen, R.A.M.C., of the 15th Scottish Hospital, has kindly furnished the Commission with material for study and testing.

In the course of our experimental work on the reproduction of sandfly fever in humans, one pool of human sera was also found to contain the infectious agent (icterogenic agent). As a result of using this pool a number of cases of infectious hepatitis were experimentally produced with incubation periods ranging from 70 to 130 days.⁸ Comparisons between the experimental and natural disease were made. Data on the length of the incubation period were accumulated and it seems definite that the incubation period is shorter in the natural disease than in the experimental, for in the natural disease it may be from 35 to 100 days based on the time in which men contracted the disease after arriving in North Africa from the United States.¹⁶ We believe that the significance of this difference deserves to be investigated further.

For the continuation of work on experimental infectious hepatitis, a laboratory for this special purpose has been established at the Yale University School of Medicine under the direction of Dr. Paul and Capt. Havens.

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8/11

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Numbers of military cases were seen in Egypt and Transjordan in 1943.

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benefited from informal discussions which have been held with various

members of the R.A.M.C. in connection with problems about this disease.

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kindly furnished the Commission with material for study and testing.

In the course of our experimental work on the reproduction of

sandfly fever in humans, one pool of human sera was also found to contain

the infectious agent (tetracycline agent). As a result of using this pool

a number of cases of infectious hepatitis were experimentally produced.

With incubation periods ranging from 70 to 130 days.⁸ Comparisons between

the experimental and natural disease were made. Data on the length of the

incubation period were accumulated and it seems definite that the incubation

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SUMMARY

Some of the objectives and many of the technical and administrative problems which confronted the members of the Neurotropic Virus Disease Commission in their recent expedition to the Middle East are described.

Brief outlines of the work done on sandfly fever, poliomyelitis and infectious hepatitis are mentioned, with omission of the scientific findings which are to be found in the reports of the Commission.

These data have been accumulated in the hope that they may be of value to the members of other expeditions which may be organized for similar purposes.

Respectfully submitted,

John R. Paul, M.D.
Director

May 3, 1944

REFERENCES

Middle East "Virus Commission" Reports
May 1, 1943 - May 1, 1944

The following reports of work done in the Middle East have been issued by this Commission. Nearly all of them have been submitted to the Office of the Chief Surgeon, U.S.A.F.I.M.E., and all of them to the Division of Preventive Medicine, Surgeon General's Office.

1. May 1943. Outline of Preliminary Program for the "Virus Commission".
2. May 1943. Preliminary Observations on the Effectiveness of Certain Repellents on Phlebotomus papatasi, by Maj. A. B. Sabin, M.C.
3. May 1943. Preliminary Review on Pappataci (Sandfly) Fever as a Military Disease of the Middle East. I. Prevalence and Seasonal Data.
4. July 1943. Sandfly (Pappataci) Fever as a Military Disease in the Middle East - prepared at the request of Col. C. F. Sams, M.C. This article has formed the basis of Circular Letter No. 28, entitled: Sandfly (Pappataci) Fever, issued by the Office of the Chief Surgeon, Medical Section, U.S.A.F.I.M.E.
5. Sept. 7, 1943. Estimate of the Extent to which Sandfly Fever was and is a Problem among American Forces in Sicily, by Maj. A. B. Sabin, M.C. Prepared for and submitted to the Chief Surgeon, Seventh Army.
6. Sept. 24, 1943. Interim Report of the Activities and Studies carried out by the "Virus Commission" in the Middle East and in Sicily (April - October, 1943), by J. R. Paul, Maj. A. B. Sabin, M.C., and Maj. C. B. Philip, Sn. C.
7. Nov. 16, 1943. Report on Infectious Hepatitis among American Troops in Sicily, by J. R. Paul, and Capt. W. P. Havens, Jr., M.C. Prepared for and submitted to the Chief Surgeon, Seventh Army, and to the Chief Surgeon, N.A.T.O.U.S.A.

May 1, 1943 - May 1, 1944

The following reports of work done in the Middle East have

been prepared by the Chief Surgeon, U.S.A.F.I.M.E., and all of them to

the Division of Preventive Medicine, Surgeon General's Office.

1. May 1943. Outline of Preliminary Program for the "War Commission".

2. May 1943. Preliminary Observations on the Effectiveness of Control

Measures on Phosphorus prepared, by Maj. A. B. Seale, M.C.

3. May 1943. Preliminary Review on Propaganda (Sandy) Fever as a

Military Disease of the Middle East. I. Prevalence and Seasonal Data.

July 1943. Sandy (Propaganda) Fever as a Military Disease in the

Middle East - prepared at the request of Col. C. F. Sams, M.C. This

article has formed the basis of Circular Letter no. 32, entitled:

Sandy (Propaganda) Fever, issued by the Office of the Chief Surgeon,

U.S.A.F.I.M.E.

Sept. 7, 1943. Abstract of the Report on which Sandy Fever was and

is a Periodic among American Forces in Sicily, by Maj. A. B. Seale, M.C.

Prepared for and submitted to the Chief Surgeon, Seventh Army.

Sept. 24, 1943. Interim Report of the Activities and Studies carried

out by the "War Commission" in the Middle East and in Sicily (April -

Sept. 1943) prepared by Maj. A. B. Seale, M.C., and Maj. C. F.

Smith, M.C.

Sept. 24, 1943. Report on Phosphorus prepared by Maj. A. B. Seale, M.C.

in Sicily, by J. R. Pugh, and Capt. W. P. Havens, Jr., M.C. Prepared

for and submitted to the Chief Surgeon, Seventh Army, and to the Chief

Surgeon, U.S.A.F.I.M.E.

8. Dec. 4, 1943. Preliminary Report on Infectious Hepatitis in American Troops in the Middle East and North Africa, by J. R. Paul.
9. Feb. 1944. Poliomyelitis in British and American Troops in the Middle East, The Isolation of Virus from Human Faeces, by J. R. Paul, Capt. W. P. Havens, Jr., M.C., and Maj. C. E. van Rooyen, R.A.M.C. (To be published)
10. Feb. 1944. Susceptibility of East African Monkeys to Experimental Poliomyelitis, by J. R. Paul. (To be published in the Yale J. Biol. & Med.)
11. Mar. 1944. Infectious Hepatitis. A Clinical Review of 200 Cases seen in American Troops in the Middle East, by Capt. W. P. Havens, Jr., M.C. (To be published)
12. Mar. 1944. Preliminary Report of Studies on Strains of Poliomyelitis Virus collected in the Middle East and in the U.S.A. I. Adaptation of a Middle East Strain to the Cotton Rat and Mouse, by R. Ward, and J. L. Melnick.
- 13.* Mar. 1944. Phlebotomus (Pappataci or Sandfly) Fever, by Maj. A. B. Sabin, M.C., Maj. C. B. Philip, Sn. C., and J. R. Paul. (To be published)
- 14.* Apr. 1944. Dimethyl Phthalate as a Repellent in Phlebotomus (Pappataci or Sandfly) Fever, by J. R. Paul, Maj. C. B. Philip, Sn.C., and Maj. A. B. Sabin, M.C. (To be published)
- 15.* Apr. 1944. Phlebotomus (Pappataci, Sandfly) Fever. War Department Technical Bulletin.
- 16.* Apr. 1944. Annual Report of the Commission on Neurotropic Virus Diseases, to the Board for the Investigation and Control of Influenza and other Epidemic Diseases in the Army, by J. R. Paul.

* Not yet submitted to the Chief Surgeon, U.S.A.F.I.M.E.

1. Feb. 1944. Polioepidemic in British and American troops in the Middle East. The isolation of virus from human faeces, by J. R. Paul, Capt. M. C. (To be published)

2. Feb. 1944. Susceptibility of East African monkeys to experimental poliomyelitis, by J. R. Paul. (To be published in the Yale J. Biol. Med.)

3. Mar. 1944. Infectious hepatitis. A clinical review of 200 cases seen in American troops in the Middle East, by Capt. W. P. Havens, M.C. (To be published)

4. Mar. 1944. Poliomyelitis (epidemic or epidemic) Fever, by Maj. A. Sabin, M.C., Maj. C. B. Phillips, Sr. C., and J. R. Paul. (To be published)

5. Apr. 1944. Poliomyelitis as a Recurrent in Poliomyelitis (epidemic or epidemic) Fever, by J. R. Paul, Maj. C. B. Phillips, Sr. C., and Maj. A. Sabin, M.C. (To be published)

6. Apr. 1944. Poliomyelitis (epidemic or epidemic) Fever, by Maj. A. Sabin, M.C., Maj. C. B. Phillips, Sr. C., and J. R. Paul. (To be published)

7. Apr. 1944. Poliomyelitis (epidemic or epidemic) Fever, by Maj. A. Sabin, M.C., Maj. C. B. Phillips, Sr. C., and J. R. Paul. (To be published)

8. Apr. 1944. Poliomyelitis (epidemic or epidemic) Fever, by Maj. A. Sabin, M.C., Maj. C. B. Phillips, Sr. C., and J. R. Paul. (To be published)

9. Apr. 1944. Poliomyelitis (epidemic or epidemic) Fever, by Maj. A. Sabin, M.C., Maj. C. B. Phillips, Sr. C., and J. R. Paul. (To be published)

10. Apr. 1944. Poliomyelitis (epidemic or epidemic) Fever, by Maj. A. Sabin, M.C., Maj. C. B. Phillips, Sr. C., and J. R. Paul. (To be published)

APPENDIX

of

REPORT OF THE "VIRUS COMMISSION"

MAY 3, 1944

SECTION I

Personnel (as of Sept. 1943)

Director: Dr. John R. PAUL

Members : Major Albert B. SABIN, M.C.

Major Cornelius B. PHILIP, Sn.C.

Assistant: Captain W. P. HAVENS, Jr., M.C.*

Liaison Officer from 38th General Hospital: Captain W. C. STAHL, M.C.

Technicians: Sgt. T/3 Robert A. GOLDWASSER
Sgt. T/4 Julius D. DWORKOWITZ

Nurses: 2nd Lt. Bessie L. FRITZ
2nd Lt. Lydia CRESSMAN

Secretary: Miss Carol F. HILAL

In Charge of Ward and Animal Quarters: Sgt. T/4 Maurice A. TEDDLIE

Animal Men: Cpl. Robert F. SPRAGUE
Pvt. Adonio CHAVEZ

Ward Man: Pvt. Bryll POWELL

Driver: Efraim TANIOUS Khalil

* Capt. Havens was subsequently permanently assigned to the Neurotropic Virus Disease Commission.

SECTION II

Lists of Equipment

The following items were taken with the "Virus Commission".

When packed in 3 trunks the total weight came to 475 lbs.

Lyophilization Apparatus

Base for motor and pump

1 motor

1 pump (Duoseal)

1 cylinder and trays (Cryochem)

1 bottle pump oil

1 motor pulley

1 heavy rubber tubing

1 envelope with parts - Y tube, etc.

1 forceps for sealing glass

1 small bunsen burner

5 lbs. Cryochem dessicant

1 desk torch - rubber tubing

1 McLeod gauge and accessories

1 Barr stoppering device for lyovac

1 wrench

glass tubing for safety bottle

1 box lyophile tubes:

for 25 cc - 4

5 cc lyovac - 100

for 17 cc - 6

1 cc lyovac - 100

10 cc ampules - 12

rubber stoppers for above

20 cc vacuum bottles - 6

Microscope

1 Dissecting microscope for use in entomological laboratory

Instruments

2 doz. large scissors - straight

1 doz. scissors - curved

1 doz. mouse tooth forceps

6 straight forceps, fine

6 curved forceps, fine

3 iris forceps

3 fine tissue forceps

2 straight artery clamps

1 curved artery clamp

1 bone saw

2 bone cutting shears

1 large bone forceps

1 retractor

1 chisel

48 knife blades

4 Bard Parker knife handles #3

1 large trephine

3 instrument trays

Glassware

144 Wassermann tubes
 50 pyrex centrifuge tubes, 15 cc
 2 calibrated centrifuge tubes, 15 cc
 4 small centrifuge tubes
 glass tubing for safety bottle
 Pipettes: for 1 cc - 105
 for 5 cc - 25
 for 10 cc - 25

Syringes

for 1 cc - 15
 for $\frac{1}{4}$ cc - 5
 for 2 cc - 10
 for 5 cc - 5
 for 10 cc - 5
 for 20 cc - 5

Needles

18 Needles 20 G
 6 " 18 G
 24 " 25 G
 144 " 27 G

Thermometers

3 0-110° C.
 24 Clinical

Miscellaneous

10 mortars
 10 pestles
 3 lbs. glycerine
 2 pads lens paper
 1 pad bibulous paper
 1 rubber egg holder
 4 rolls scotch tape
 1 roll paper labels
 1 roll adhesive tape
 1 leucite cover (wrapped around cylinder)
 1 pliers
 1 glass bottle with trephine, rubber bulbs, wax pencils,
 dissecting needles
 1 ampule with rubber stoppers for vials
 1 box microscope slides
 1 box cover glasses
 20 push pins
 1 two hole rubber stopper
 3 100 cc bottles nembutal
 Stains
 Parafilm
 test tube rack-wire

- 1 lb. Alundum
- 2 Punches (animal tags)
- 2 Loop holders
- 2 sets animal tags

Antigens and Serum

- 1 box containing lyophilized virus and sera

Some of this material could have been supplied by the Army Medical Supply Depot at Camp Huckstep but the great majority of these items could not have been obtained abroad.

Material furnished by the local Medical Supply Depot consisted of:

- Office equipment - desks, typewriters, etc.
- Laboratory apparatus
- 1 electric sterilizer
- 1 hot plate
- 1 electric incubator
- 1 serological water bath
- 1 refrigerator
- 1 small centrifuge
- Miscellaneous glassware and reagents
- Books and medical stores

Material furnished by the 38th General Hospital consisted of:

- 1 refrigerator
- Beds and bedding
- Sick room and nurses' supplies

Material purchased by the Army and the "Virus Commission" from

local houses in Cairo consisted of:

- 1 large centrifuge
- 2 incubators
- Cloth for screening the building

SECTION III

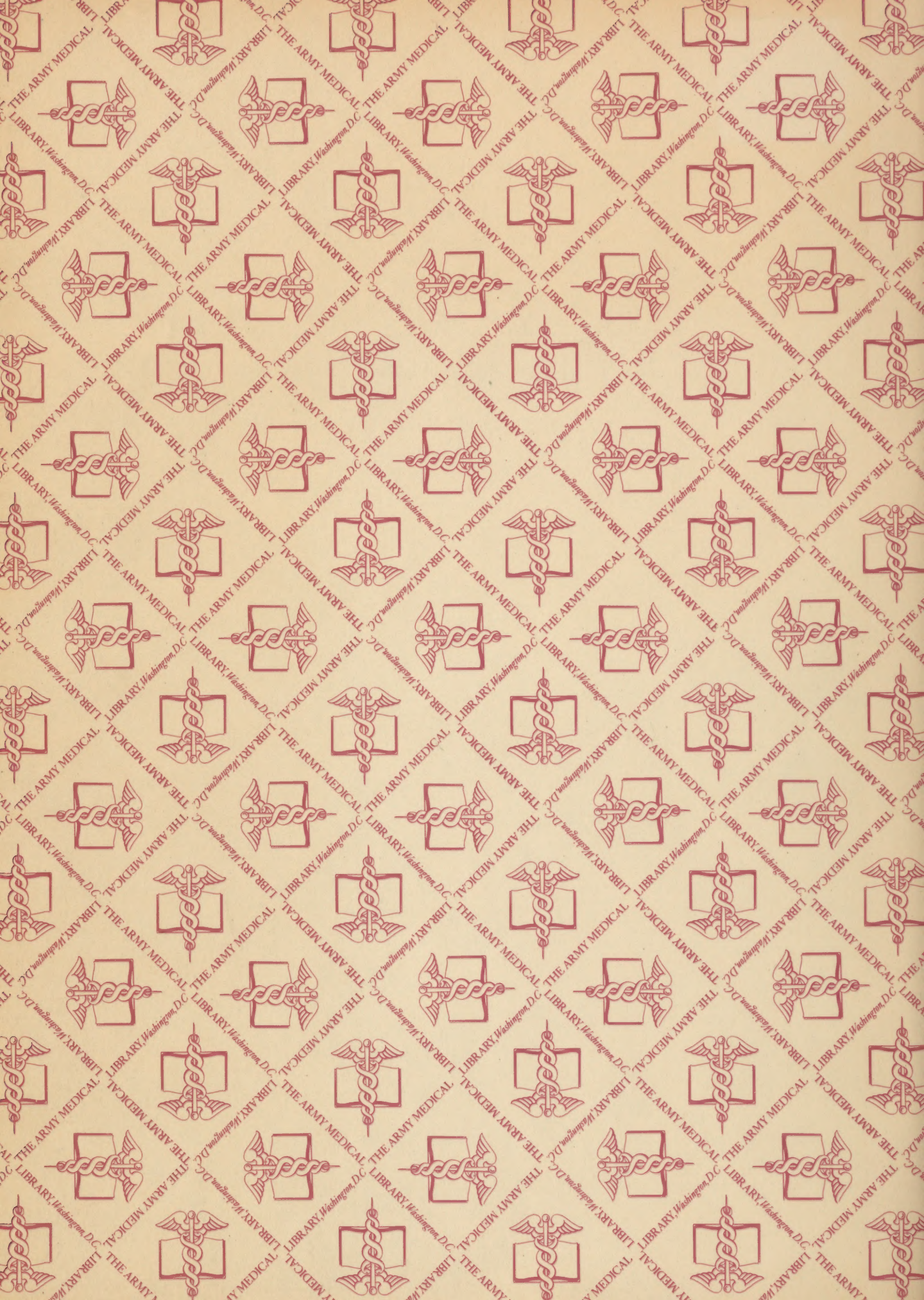
List of Volunteers

Men who volunteered for experimental inoculation with the virus of Pappataci fever:

Cpl. BELTON, Frederick Q.	- ASN 34363164, 328th Q. M. Dep. Comp.
Cpl. ROSENBERG, Richard E.	- " 19028210, 38th General Hospital
Pvt. DICKEY, Lloyd Richard	- " 38020248, 38th General Hospital
Pvt. ENGLAND, Joe P.	- " 38126781, 38th General Hospital
T/5 BERNARD, Abraham	- ASN 32219549, 607th Ordn.Base Armament Maint. Bn.
Pvt. BERRY, H. David	- " 39554452, 404th Q. M. Truck Comp.
Cpl. DEMPSEY, Albert P.	- " 17072971, 607th Ordn.Base Armament Maint. Bn.
Pvt. HERBSTER, John W.	- " 35528578, 404th Q. M. Truck Comp.
Cpl. PRINCE, Robert K.	- " 34124507, 607th Ordn.Base Armament Maint. Bn.
Pfc. ROGOZ, Joseph L.	- " 31105867, 607th Ordn.Base Armament Maint. Bn.
T/5 RECHTIEN, Lester E.	- ASN 37049192, 607th Ordn.Base Armament Maint. Bn.
Pfc. ROSENBERG, Samuel	- " 32410733, Army Exchange, HQ. Det., Delta Serv. Cd.
Pfc. SALVATORE, John L.	- " 35289709, Med. Det. 802 M.P. Bat.
S/Sgt. SHEPARDSON, Arthur T.	- " 33037112, 607th Ordn.Base Armament Maint. Bn.
T/5 ALDRICH, Daniel E.	- ASN 12055285, 607th Ordn. Bn.
Pvt. KOWAL, Alex E.	- " 36363049, 781st M.P. Bn.
Pvt. FITZSIMMONS, Robert J.	- " 32179168, 607th Ordn. Bn. Disp.
Pvt. FREIBAND, Raymond	- " 32218903, 607th Ordn. Bn.
Pfc. KACZMARCZYK, Chester S.	- ASN 12073527, H & S 496 Engr. Co.
Pvt. BILES, Robert	- " 13136674, 26th Med. Supply Platoon
Pvt. BUSCH, Charles W.	- " 15012174, 209 Signal Depot Co.
Cpl. COX, Harry	- " 32285119, 209 Signal Depot Co.

Group volunteering for 3 weeks:

Pvt. BENERETIS, Saturnino B.	-	ASN 18119841,	38th General Hospital
Pvt. CALLUZZO, John C.	-	" 32216480,	38th General Hospital
Pvt. FOLEY, Michael J.	-	" 38136974,	38th General Hospital
Pvt. FOX, Sidney A.	-	" 20300431,	38th General Hospital
Pvt. HOLCUMB, Kenneth J.	-	" 18108038,	38th General Hospital



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